

REMARKS / ARGUMENTS

Description and Support For The Amendments

The amendment to claim 26 states that step of backwashing the membranes with a cleaning chemical occurs after step (b), step (b) involving generating a filtered permeate. This amendment, in conjunction with the rest of the wherein clause of claim 26, clarify that, when the membranes are backwashed with a cleaning chemical in the cycle, the backwash with the cleaning chemical occurs between the permeation step of a cycle and the start of a subsequent cycle. The applicants submit that the amendment to claim 26 is supported by the sections of the specification from page 9, line 19, to page 11, line 1; page 15, line 22 to page 16, line 27, and by Example 1 (see page 27, line 19 to 22) and Example 2 (see page 28, line 4 to 8).

Claim 27 is amended in two ways. Firstly, the words "having a selected concentration" are deleted since the same words already appear in claim 26 which claim 27 depends on. Secondly, claim 26 is amended to specifically refer to the cycles of part (f) of claim 26 and to state that those cycles are repeated at least once a day. This is supported by page 18, line 29, to page 19, line 3.

The Applicants submit that no new matter has been added by any of these amendments.

Information Disclosure Statement

The Applicants have recently filed a Supplemental Information Disclosure Statement under a separate cover. The Applicants submit that the present claims are allowable over these additional references.

Election/Restrictions

The Applicants confirm the election of claims 26 to 30 noted in the Office Action. Claims 1 to 25 are cancelled.

Claim Rejections – 35 USC 112

Claim 27 was rejected under 35 USC 112 as being indefinite because the phrase "between once a day and once a cycle" was confusing. Claim 27 has been amended to confirm that the cycles referred to are the cycles of part (f) of claim 26 as assumed in the Office Action. Claim 27 has also been amended to state that the cycles are repeated at least once a day. The Applicants submit that this amendment resolves any indefiniteness suggested in the Office Action which may have resulted from the possibility of a cycle being performed less frequently than once a day.

Claim Rejections – 35 USC 102

Claims 26 to 30 were rejected as being anticipated by Smith et al. (U.S. 5,403,479).

Claim 26 describes repeated cycles including a step of draining the tank. As noted in the Office Action, Smith '479 does not advocate periodically draining the tank. In addition, the Office Action has not provided any reference to where draining the tank, even on a non-periodic basis, is discussed in Smith '479. Of the references given, column 10, lines 59-68, are included in the Background of the Invention section of Smith '479 and relate to a system of cleaning from the outside of a fibre. Such a system is not the system proposed in Smith '479 and not a system having the other elements of claim 26. The second citation, to column 18, lines 13-29, does not refer to any draining of the tank. The Applicants submit that Smith '479 does not disclose draining the tank in repeated cycles as claimed. Further, claim 26, as amended, recites that the step of backwashing the membrane with a cleaning chemical occurs after performing step (b) (a permeation step). The Applicants submit that Smith '479 does not disclose any repeated cycle in which this is the case. In contrast, Smith '479 describes a process in which steps involving cleaning with a biocidal solution are followed by a return to

permeation (see for example column 18, lines 23-25), without first draining and refilling the tank.

Regarding claim 27, this claim has been amended to state that the cycles are repeated at least once per day. Smith does not teach repeating a cycle as defined by the present claims once per day. In contrast, as noted in the Office Action, Smith does not advocate periodic draining of the tank.

Claims 28-30 are dependant on claim 26 and are not anticipated at least for the reasons given in relation to claim 26. Further, the Applicants respectfully submit that Figures 4 and 6 of Smith '479 do not support the rejection of claims 29 and 30 as suggested by the Office Action. In relation to Figure 4, Smith '479 shows a series of independent cleaning steps which do not form any repeated cycle. As described in column 18, line 30, to column 19, line 62, of Smith '479, the applications of biocidal solution reported in Figure 4 were done as part of an investigation into the relative effect of different combinations of concentration and duration and not any repeated cycle. Claims 29 and 30 cite products of concentration and duration summed over all backwashes with a cleaning chemical occurring in a week. While the product of concentration and duration might be determinable for a single event in Figure 4, there is no teaching in Figure 4 as to what is a representative week and therefore no basis for calculating a sum of products and concentration over a week based on Figure 4.

Regarding Figure 6, page 3 of the Technical Service Bulletin attached as Appendix "A" gives a ratio of 7.7 kg to 378.5 L of water to produce a solution of citric with a pH of 2.5 as used in the example of Figure 6 (see column 20, line 55). This converts to over 20,000 mg/L of citric acid. Dividing this by 20 to provide an equivalent concentration of NaOCl (see page 22, lines 26-28 of the specification) gives 1,000 mg/L. Since each cleaning event in Figure 6 of Smith '479 is 15 minutes, and there are 7 cleaning events per week, the total duration for the week is 105 minutes. The sum of the products of concentration and duration is therefore 105,000 min•mg/L, which is well above the range specified in the present claims.

A daily cleaning event is also described in Figure 5. That cleaning event involves the daily application of 300 ppm of OCl⁻ for 15 minutes (see column 19, lines 6-25, particularly lines 6 and 20). This equates to 425 mg/L of NaOCl or 6525 minutes•mg/L of NaOCl per cleaning event. On a weekly basis, this is 45,675 minutes•mg/L of NaOCl which is again above the ranges in claims 29 and 30. ^(see col. 19, line 20)

Conclusion

The applicants submit, for the reasons above, that the claims as amended are not anticipated by Smith '479. The Applicants further submit that the other citations in the Office Action (Cote '593 and Cote '231) similarly do not interfere with the allowability of this application. Accordingly, the Applicants submit that the claims are allowable.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **“Version with markings to show changes made.”**

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

COTE et al.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims:

Claims 1-25 have been deleted.

Please amend claims 26 and 27 as follows:

26. (Amended) A process for filtering water containing solids with membranes in a tank comprising the steps of:

a) filling the tank with a feed water to be filtered to immerse the membranes;

b) creating a transmembrane pressure between a permeate side and a retentate side of the membranes, the retentate side of the membranes being in contact with the water in the tank, the permeate side being fluidly connected to a filtered permeate outlet, to generate a filtered permeate at the permeate outlet;

c) aerating the membranes to dislodge solids from the membranes;

d) backwashing the membranes;

e) draining the tank; and,

f) performing the steps above in repeated cycles

wherein the steps of backwashing the membranes and draining the tank may be performed either before the other or partially or substantially simultaneously and the step of backwashing the membranes in the repeated cycles periodically involves backwashing with a cleaning chemical having a selected concentration for a selected duration after performing step (b).

27. (Amended) The invention of claim 26 wherein the cycles of part (f) of claim 26 are repeated at least once a day and the step of backwashing the membranes in the repeated cycles involves backwashing with a cleaning chemical ~~having a selected concentration between once a day and once a cycle.~~



Technical Service Bulletin

December 2000 TSB111.05

Cleaning Procedure for Ultrafiltration Membranes used for Oily Water Separations

This bulletin provides general cleaning instructions for 2000 type membrane modules which have been used to treat oily water solutions. The 2000 type membrane is a hydrophilic polyolefin which has no surface charge.

The ultrafiltration system should be cleaned when the permeate flux has decreased to 70% of its design rate of flow, or to an otherwise unacceptable level. Prolonged operation of a fouled membrane will shorten its useful life and make effective cleaning more difficult.

1. Shut down the UF unit to be cleaned. Be sure to follow all safety procedures for system shutdown.
2. Flush the UF membranes with UF permeate which has been stored in the cleaning tank. Flush for at least 10 minutes at normal operating flow to dislodge large foulants from the system.
3. Prepare the cleaning solutions. The cleaning solutions must be prepared with UF permeate or potable water. Prepare the solutions as per the instructions below in the "Instructions for Cleaning Solution Preparation." Note that the instructions are for making 100 gallons of cleaning solution. Adjust the volume of cleaning solution according to the size of the system to be cleaned.
4. Warm the cleaning solution to 90 - 100°F. **DO NOT EXCEED 105°F!** Cleaning with warm water is much more effective than cleaning with cold water.
5. Circulate the cleaning solution through the system for 30 minutes. Circulate at a fairly high flow rate, since high flow has a scouring effect which will assist in loosening foulants from the surface of the membrane. Normal operating flow rates (30 to 50 gpm/module or pressure vessel) should be used during the cleaning operation.
6. After the 30 minute circulation, stop the circulation pump and close all cleaning valves. Let the solution soak in the system for a minimum of 2 hours.
7. After the soak period, re-open the cleaning valves and recirculate the cleaning solution for another 30 minutes.

8. If using sponge balls to assist in cleaning the system (tubular modules only), introduce the sponge balls at the start of the second recirculation (Step 7). Be sure to count the sponge balls before introducing them into the system in order to insure their removal from the system.
9. Discard the cleaning solution and rinse the UF membrane with UF permeate or potable water until no traces of cleaning solution remain.

Instructions for Cleaning Solution Preparation

Cleaning Solutions for Removal of Organics

1. Detergent Solution

<u>Component</u>	<u>Quantity per 100 Gallons</u>
Sodium Tripolyphosphate	17 pounds (7.7 kg)
Sodium Dodecylbenzenesulfonate	2 pounds (.91 kg)
UF permeate	100 gallons (378.5 l)

Note: When mixed at these dilutions, the cleaning solution will be at pH 9.6 to 10.

2. Sodium Hydroxide Solution (pH = 12)

<u>Component</u>	<u>Quantity per 100 Gallons</u>
Sodium Hydroxide	1.8 pounds (0.85 kg)
UF permeate	100 gallons (378.5 l)

Cleaning Solutions for Removal of Metal Oxides

1. Acetic Acid Solution (pH ≈ 2.5)

<u>Component</u>	<u>Quantity per 100 Gallons</u>
Acetic Acid	17 pounds (7.7 kg)
UF permeate	100 gallons (378.5 l)

2. Citric Acid Solution (pH \approx 2.5)

<u>Component</u>	<u>Quantity per 100 Gallons</u>
Citric Acid	17 pounds (7.7 kg)
UF permeate	100 gallons (378.5 l)

3. Hydrochloric Acid Solution (pH \approx 2.0)**Sanitizing Solutions**

- | | | |
|----|-------------------|---------------------|
| 1. | Free Chlorine | 5 - 20 ppm solution |
| 2. | Sodium Bisulfite | 1% solution |
| 3. | Hydrogen Peroxide | 1% solution |

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